T.E Computer Sem V Principles of Digital comm? 15/5/06

[REVISED COURSE]

CON/1705-06.

TV-8298

(3 Hours) [Total Marks : 100

N.B. : 1] **Question no. 1** is compulsory
2] Attempt is all **five questions**
3] **Figures** to the right indicate full marks
4] Draw neat **diagrams / block diagrams** wherever necessary.

1) Answer the following
   a) Draw the power spectra for BPSK, QPSK and MSK modulated signal. [5]
   b) What are advantages and disadvantages of digital communication system? [5]
   c) In ASK, FSK and PSK modulation expression, the amplitude coefficient is $\sqrt{2}\,E/T$. Explain how? [5]
   d) Explain central limit theorem. [5]

2)
   a) What is binary symmetric channel? Explain optimum Receiver Algorithm for binary symmetric channel with example. [12]
   b) A random variable X has the uniform pdf (Probability density function) given by $Px(x) = 1/(b-a), \quad a \le x \le b$
      $= 0, \quad$ Otherwise
      i. Compute the mean of the random variable.
      ii. Compute the variance of the random variable
      iii. If $a = -\frac{1}{2}$ and $b = \frac{1}{2}$ find mean and variance of the random variables. [8]

3)
   a) Explain in detail offset and non-offset QPSK. Support your answer with appropriate block diagram and waveforms. [10]
   b) Explain the transmitter and receiver of binary frequency shift keying (BFSK). Also draw the signal space diagram of orthogonal BFSK. [10]

4)
   a) What is matched filter? Derive the expression for the minimum probability of error of the matched filter. [10]
   b) What is line coding? Draw the waveforms for different line coding. Assume the binary sequence 10110101. [10]

5)
   a) Explain the Shannon's Information Capacity Theorem. Show that channel capacity for channels of infinite bandwidth is
   $C_{\infty} = 1.44\ S/\eta$ bits per sec. [8]
   b) What is Huffman code? Explain the algorithm of the code. For the code shown in table.

Symbol	M1	M2	M3	M4	M5	M6
Probability	0.3	0.25	0.15	0.12	0.10	0.08

Find
   i. Average length of this Huffman code.
   ii. The entropy of the source
   iii. The code efficiently
   iv. The redundancy of a code

6)

6)

a) Explain the decoding operation in linear block codes. If a certain code word is transmitted which is received as 1110110. Check if any error has occurred at the receiving end. How would you obtain the correct transmitted code word if a single error has occurred?
If parity check matrix H = $\begin{bmatrix} 1 & 1 & 1 & 0 & 1 & 0 & 0 \\ 1 & 1 & 0 & 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 1 & 0 & 0 & 1 \end{bmatrix}$ [10]

b) Explain in detail convolution coding. [10]

7) Write a short note on the following (Any two) [20]

i) Inter symbol interference (ISI) and equalization.
ii) Link budget analysis for wireless communication system
iii) Signature authentication using public key cryptosystem.